

Superseded by TM 11-963, Feb 55
HISTORICAL

WAR DEPARTMENT TECHNICAL MANUAL

TM11-963

C3 needed
RECTIFIER

RA-83-A

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RECTIFIER

RA-83-A



WAR DEPARTMENT

7 January 1944

WAR DEPARTMENT,
WASHINGTON 25, D. C., 7 January 1944

TM 11-963, Rectifier RA-83-A, is published for the information
and guidance of all concerned.

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BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

J. A. ULIO,
*Major General,
The Adjutant General.*

DISTRIBUTION: I Bn 11(3); IC 11(10)
(For explanation of symbols see FM 21-6.)

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DESTRUCTION NOTICE

WHY —To prevent the enemy from using or salvaging this equipment for his benefit.

WHEN—When ordered by your commander.

HOW —1. Smash or cut—Use sledges, axes, hand-axes, pick-axes, hammers, crowbars, heavy tools, large rocks, or explosives such as TNT, grenades, firearms, etc.

2. Burn—Use gasoline, kerosene, oil flame-throwers, incendiary grenades, etc.

3. Disposal—Bury in slit trenches, fox-holes, other holes. Throw in streams. Scatter.

4. **USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT.**

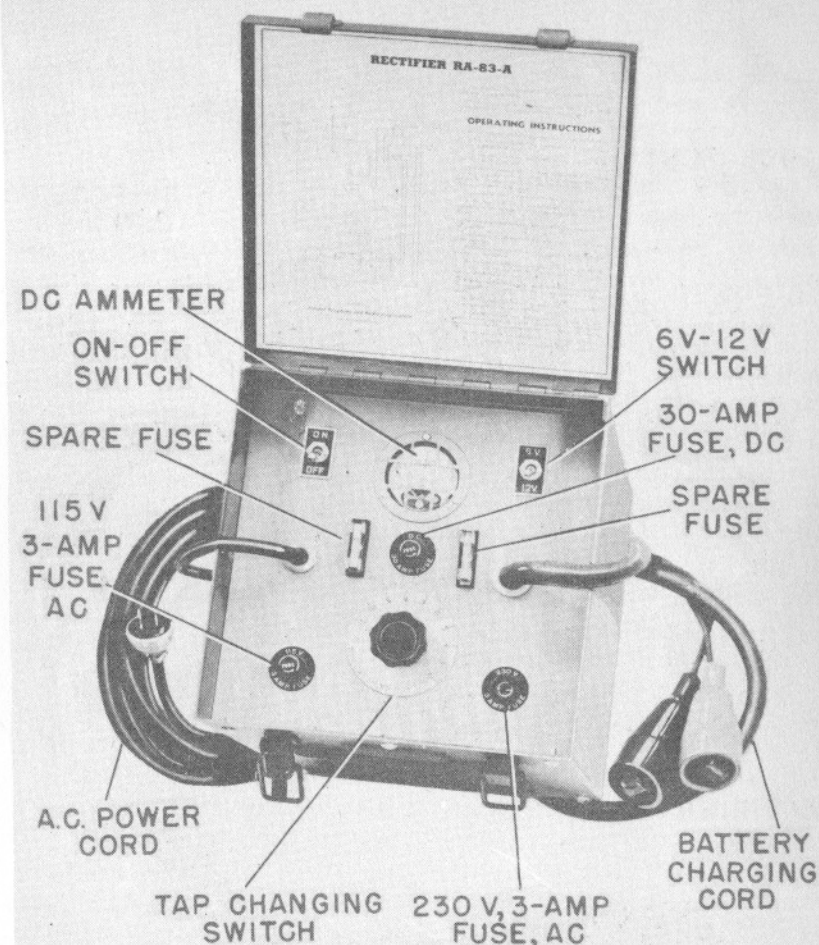
WHAT—Smash—Rectifier stack, transformer and all other parts.

Burn—Technical manual.

DESTROY EVERYTHING

SAFETY NOTICE

Severe electric shock may result from contact with A.C. power cord in this equipment. Always disconnect the power cord when working on the unit.



TL 90102

Figure 1 — Rectifier RA-83-A — Top View with Cover Open

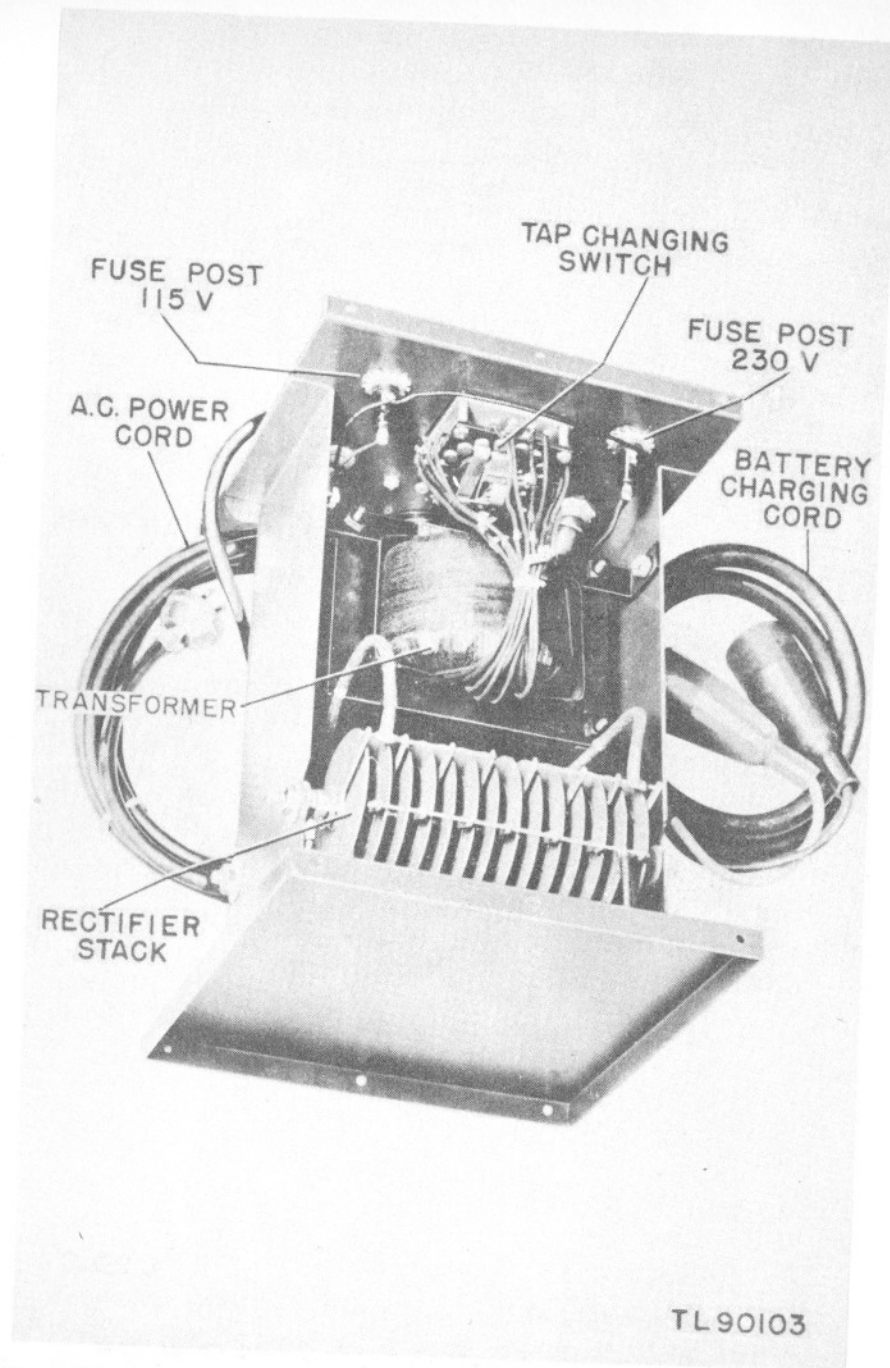


Figure 2—Rectifier RA-83-A—Internal View Showing One Rectifier Stack

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Section I

DESCRIPTION

1. GENERAL.—Rectifier RA-83-A converts 115 or 230 volts, 50 to 60 cycles, A.C. power to 6 or 12 volts, D.C. power for the charging of 3 or 6-cell storage batteries.

2. DESCRIPTION.—The rectifier or charger chassis on which all the component parts are mounted, is enclosed in a sheet metal case. The bottom of the chassis serves as the base of the unit. A hinged sheet metal cover is provided to enable access to the control panel. A handle is attached to the cover so that it may be easily picked up and moved about. The necessary attachment cords are stored above the control panel and protected by the hinged cover. The A.C. power cord is provided with a heavy duty attachment plug and enters the rectifier through an insulating bushing at the left-hand side of the panel. The battery charging cord is provided with two battery clips. These clips are provided with rubber protectors, one red and one black, to indicate polarity. This cord enters the rectifier through an insulating bushing at the right-hand side of the panel. By uncoiling and extending these cords, the top of the chassis, which serves as the control panel, is seen. The following are mounted on the panel:

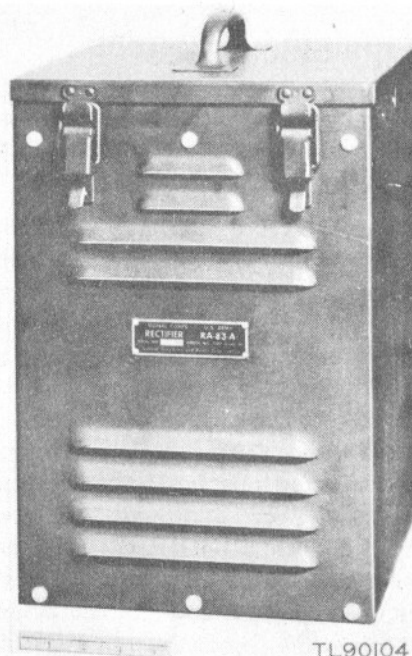
1. ON-OFF switch
2. 6V-12V switch
3. 30 AMPERE fuse post for the D.C. output
4. 3 AMPERE fuse post for the 115V. input
5. 3 AMPERE fuse post for the 230V. input
6. Dial switch
7. Ammeter
8. 3 AMPERE spare fuse in fuse block
9. 30 AMPERE spare fuse in fuse block

Condensed operating instructions and a wiring diagram are attached to the inside of the cover. The complete unit with cover open is shown in Figure 1.

3. POWER.—(a) Input: The maximum power input is approximately 325 watts with a full load on the D.C. output. The circuit is operated at approximately 115 volts or 230 volts, single phase and from 50 to 60 cycles.

(b) Output: The output available is 20 amperes at 6.0 volts or 10 amperes at 12.0 volts.

RECTIFIER RA-83-A



TL90104

Figure 3—Rectifier RA-83-A—Ready for Transportation—Cords Coiled in Lid

4. WEIGHT AND DIMENSIONS.—The charger weighs 51 lb. and is 16-9/16" high x 10³/₁₆" wide x 10³/₄" deep.

Section II

INSTALLATION AND OPERATION

5. INSTALLATION.—(a) Put the charger in a cool, dry, well-ventilated place. The charger should be kept off damp ground and kept in a position not subject to direct sunlight.

CAUTION: DO NOT PLACE CHARGER DIRECTLY OVER THE BATTERY. BATTERY FUMES ARE CORROSIVE. (b) Release the two cover latches and raise the cover to its full open position. Extend the rubber covered cords from inside of case.

6. VOLTAGE INPUT.—POWER SUPPLY. Check the power supply to be sure it is 115 volts or 230 volts, 50 to 60 cycles, A.C. **NEVER CONNECT THE SUPPLY CORD TO A D.C. SOURCE.** If in doubt, use a voltmeter.

INSTALLATION AND OPERATION

7. CONNECTIONS.—The A.C. power is brought to the charger through a 2-conductor No. 18 portable cord (at left of panel), while the output or charging current is brought to the battery through a 2-conductor No. 10 portable cord (at right of panel). Before connecting these cords, have the ON-OFF switch in the OFF position and the dial switch on No. 1 position, that is, the switch turned **LEFT**, or "counterclockwise" as far as it will go. If the power supply is 115 volts, place a 3 ampere fuse in the 115V.-3 AMP. fuse post. If the power supply is 230 volts, place a 3 ampere fuse in the 230V.-3 AMP. fuse post. **NOTE:** In order to prevent a short in the power circuit, **only one** 3-ampere fuse post should contain a fuse. To make certain that a short does not occur, only one fuse post cap is supplied to serve the two fuse posts.

8. OPERATION.—a. Charging one 3-cell battery. When one 3-cell battery is to be charged, place the 6V-12V switch in the 6V position. Attach the positive battery clip (marked +) with the **RED** rubber insulator to the positive terminal. Attach the other battery clip to the other battery terminal.

CAUTION: DO NOT ATTACH THESE LEADS UNTIL YOU HAVE MADE CERTAIN WHICH IS THE POSITIVE AND WHICH IS THE NEGATIVE BATTERY TERMINAL.

Place the ON-OFF switch in the ON position. Turn the dial switch clockwise—the same direction as the arrow to increase charge—until the ammeter reads 20 amperes. The meter scale at this point is marked 6V.MAX. This reading **must not** be exceeded. Place the cords into their slots, which have been provided at the top of the side panels, and close the cover.

b. Charging two 3-cell batteries. When two 3-cell storage batteries are to be charged, place the 6V-12V switch in the 12V position and the dial on the No. 1 position. Attach the positive battery clip (marked +) with the **RED** rubber insulator to the positive terminal of one of the batteries. Attach the other battery clip to the negative terminal of the other battery. Connect the two remaining battery terminals together, thus arranging the batteries in series. Throw the ON-OFF switch to the ON position and turn the dial switch clockwise—in the same direction as the arrow, to increase charge—until the ammeter reads 10 amperes. The meter scale at this point is marked 12V MAX. This reading **must not** be exceeded. Place the cords into their slots, which have been provided at the top of the side panels, and close the cover.

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9. PACKING FOR TRANSPORTATION.—Put ON-OFF switch in the OFF position. Disconnect the leads going to the battery and remove the cord going to the power supply. Coil the battery leads (the heavy leads) inside of the cover and then coil the power leads (the thin cord) inside of the battery leads, close cover and latch. This manual (TM 11-963) must be packed with the charger at all times. Figure 3 shows the unit ready to be moved.

Section III

FUNCTIONING OF PARTS

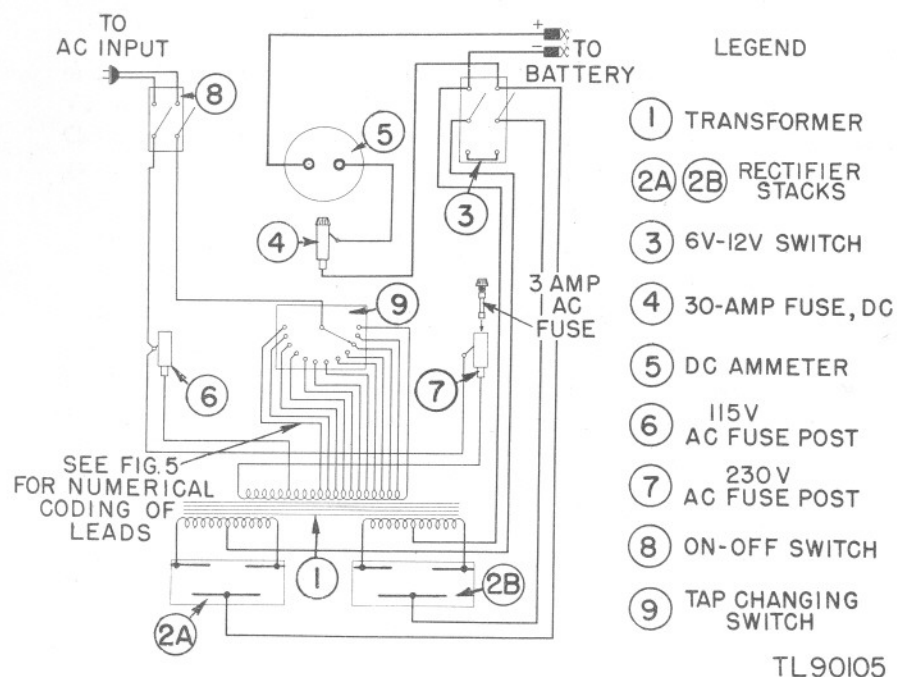


Figure 4 - Rectifier RA-83-A - Wiring Diagram

10. CIRCUIT.—Figure 5 is a schematic diagram of RECTIFIER RA-83-A. A complete wiring diagram showing the various components in physical relation to each other is given in Figure 4. The functions of the parts are discussed in the following paragraphs.

11. TRANSFORMER.—(See Fig. 2, 4, and 5). The primary winding of the transformer is connected to a 3-ampere line fuse (See

MAINTENANCE

Fig. 1, 2, 4 and 5), ON-OFF switch (See Fig. 1, 4 and 5), and cord and plug assembly (See Fig. 1, 2, 4 and 5) to the source of A.C. power. The primary of the transformer is tapped. The output of the secondary is varied by use of the tap changing switch connected to the primary taps (See Fig. 1, 2, 4 and 5). The secondary of the transformer consists of two isolated or independent windings, each having a center connection.

12. RECTIFIER.

a. Circuit. One of the two rectifier stacks is connected as shown in Figs. 2, 4 and 5 to one of the two transformer secondary windings to form a full wave rectifier circuit. The other rectifier stack is similarly connected to the other transformer secondary winding. Thus, there are provided two independent 6-volt D.C. output circuits which are connected in parallel by the 6V-12V switch (see Figs. 4 and 5) for charging 6-volt batteries, and in series for charging 12-volt batteries. The total pulsating D.C. output current is connected to the lead, through fuse, D.C. ammeter and cord and battery clips, as shown in Figs. 4 and 5.

b. Rectifier Stack. Each of the two rectifier stacks is made up of selenium rectifying discs assembled so that current can flow from either of the two short bus bars or jumpers on the stack to the long bus bar but not in the reverse direction. Thus, during one-half cycle the current flows from one end of the transformer winding to one short bus bar, through the rectifier stack to the long bus bar, to the positive terminal of the battery on test, through the battery and back to the transformer winding center tap. During the other half cycle current flows from the other end of the winding to the other short bus bar, through the other half of the rectifier stack to the long bus bar, then to the battery and back to the winding center tap (see Figs. 2, 4 and 5).

Section IV

MAINTENANCE

13. INSPECTIONS.—When installed, the rectifier requires little attention as long as it operates properly. Keep the unit free from dust and dirt. Use dry compressed air or a soft, long bristled brush to remove dust from between the discs of the rectifier stack. **CAUTION: DO NOT USE HOT AIR BECAUSE THE RECTIFIER DISCS MAY BE INJURED.** Keep the battery clips clean. Coat the jaws of the clips with grease or oil to prevent corrosion.

RECTIFIER RA-83-A

14. PROCEDURE IN CASE OF FAILURE.

(a) **GENERAL:** The following general checks will remedy most causes of failure or apparent failure of the rectifier. Check to see that the power source is operating, that the power cord plug makes good contact, that the switch is turned to the ON position and that the battery clamps make good contact. Check that the cord is in good condition and that the fuses are satisfactory. If the trouble still seems to be in the rectifier, proceed as indicated in paragraph 15. If the power source is alive and the battery shows no charge, advance the tap switch to a higher setting.

(b) **FUSES:** Check both A.C. and D.C. fuses. Turn ON-OFF switch to OFF before removing fuses. The D.C. fuse (See Fig. 1, 4 and 5) is located on the panel immediately below the ammeter (See Fig. 1, 4 and 5). A blown fuse generally indicates, (1) that the leads were not placed on the battery correctly, (2) that the D.C. power exceeded the maximum specified limits, (3) that the output leads became shorted. The A.C. fuse is located in one of the posts (See Fig. 1, 2, 4 and 5) at the lower right or left-hand corner of the panel, depending upon the voltage of the power supply. A blown A.C. fuse would indicate that (1) the fuse is in the wrong fuse post, (2) the 6V-12V switch is not in the correct position or (3) trouble in the rectifier.

15. LOCATING TROUBLE.

(a) **PROCEDURE:** Make a voltage check of the circuit starting at the A.C. input and working toward the output. Normal voltages at different load currents are given in paragraph 16. The wiring diagram (Fig. 4) will be found helpful in tracing circuits and finding connections.

(b) **TROUBLE CHART:** Cause and symptoms, as well as remedies are shown in the following chart:

Symptom	Cause	Remedy
1. No A.C. Voltage	Open power cord	Repair or replace defective parts
	Short-circuited power cord	
	Poor plug contact	
	Burned out A.C. fuse	
	Loose fuse in fuse post	
	Defective tap switch	
	Burned out transformer	

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Symptom	Cause	Remedy
2. No D.C. Voltage	Burned out D.C. fuse	Repair or replace defective parts
	Transformer secondary winding open	
	Short-circuited charging cord	
	Poor battery clip contact	
	Fuse loose in fuse post	
	Defective rectifier	Replace

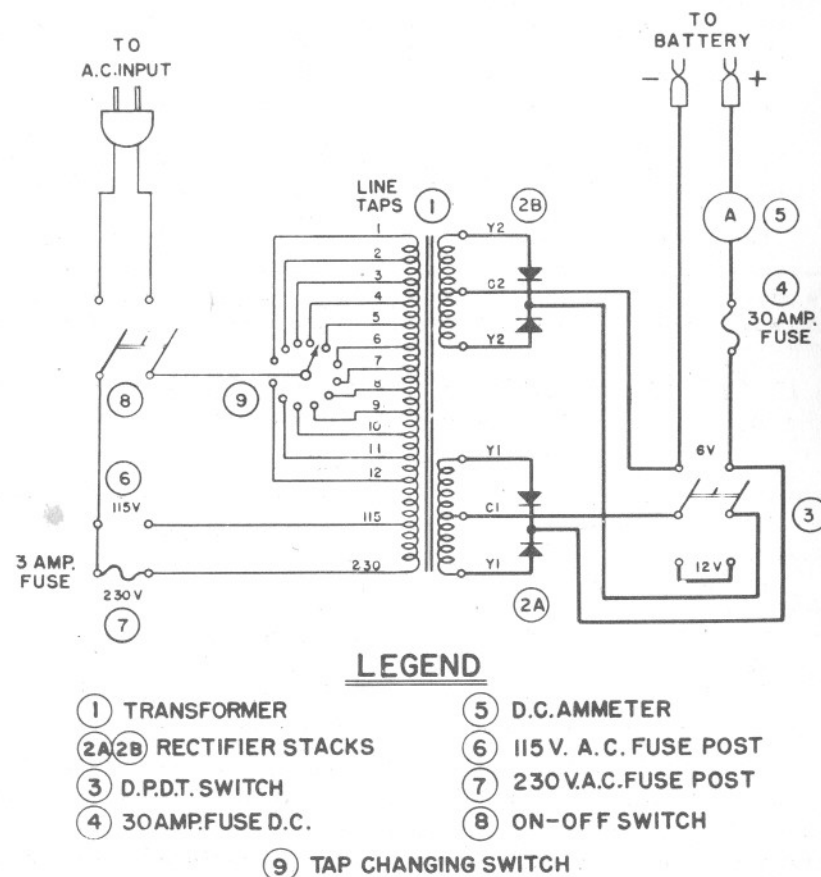


Figure 5 - Rectifier RA-83-A - Schematic Diagram

RECTIFIER RA-83-A

16. NORMAL VOLTAGE AND CURRENT READINGS: The following table will be found useful in checking the functioning of the rectifier circuits:

CONDITIONS			OUTPUT			
Dial Switch Position	6V-12V Switch Position	Input Voltage Volts	Volts		D.C. Amperes*	
			Maximum	Minimum	Maximum	Minimum
12	12V.	115	12.8	12.0	10.8	10.8
12	6V.	115	6.7	6.5	6.0	5.7
1	6V.	115	2.9	2.7	2.6	2.3
1	12V.	115	5.2	5.0	4.6	4.3
12	12V.	230	12.8	12.0	10.8	10.8
12	6V.	230	6.7	6.5	6.0	5.7
1	6V.	230	4.1	3.9	3.6	3.3
1	12V.	230	7.4	7.2	6.6	6.2

*NOTE: Because a battery does not remain stable for any length of time when charging, a resistance load is used to obtain the above values. The value of the resistor is 1.1 ± 0.1 ohms.

17. CIRCUIT RESISTANCES.—Measurements are made with the parts under test disconnected from other circuits.

(a) TRANSFORMER:

PRIMARY		SECONDARIES	
Terminals	Resistance-ohms	Terminals	Resistance-ohms
1 to 230	4.5	Total winding	.05
1 to 115	2.8	Secondaries are center tapped	
1 to 12	1.9		

(b) RECTIFIER: Using a battery operated ohmmeter, the indicated resistance between the section with the long wire jumper and either of the other two sections will be 5 to 10 ohms with the test prods connected one way and 2000 to 3000 ohms with the test prods reversed.

18. REPLACING PARTS.—All parts are easily replaceable with a soldering iron and small tools. CAUTION: DO NOT LET SOLDER FALL ON RECTIFIER DISCS AS IT MAY CAUSE THE DISCS TO OVERHEAT AND FAIL.

SUPPLEMENTARY DATA

Section V
SUPPLEMENTARY DATA
19. TABLE OF REPLACEABLE PARTS

Symbol No.	Fig. No.	Stock No.	Name of Part	Description	Function	Mfr.	Mfrs. Part No.
1	1	2Z9606.16	Complete Unit Transformer	Rectifier, RA-83A	For battery charging	1	DE-8A
2A, 2B	2, 4, 5	3H4699-83A	Rectifier	Spec. 8937, F. T. & R. Dwg. ITE-367B	Permits operation from 115 to 230V.	7	201-37
3	2, 4, 5	3Z9849.59	Switch, 6V - 12V	Dry Disc Selenium Rectifier	Changes A.C. to D.C.	1	214-25
4	1, 4, 5	3Z1939.1	Fuse Post	Double Pole Double Throw—No. 8824-K4	Output voltage selector	2	203-42
5	1, 4, 5	3F1030-22	Ammeter	30 Amp. Type HCM	Holds output fuse	3	22-34
	1	3F2828-2	Coverglass	0-30 Amperes Type 17-3 (Special Scale)	Indicates charging current	6	207-16
6, 7	1, 2, 4, 5	3Z1939.1	Fuse Post	2-in. diameter, Flush mounting, for Hoyt Model 17-3 D.C.	Protects ammeter dial	6	Insert
8	1, 4, 5	3Z9847-1	Switch, ON-OFF	30 Amp. Type HCM	Holds input fuses	3	22-34
	1, 2, 4, 5	3E4390-5	Cord Assembly, A. C. Power	Double Pole Single Throw No. 8185	Power Switch	2	203-31
9	1, 2, 4, 5	3Z9825-40.2	Tap Switch	16 Ft. No. 18, 2-Conductor with Plug	Power supply cable	1	225-01
	1, 2, 4, 5	2Z3713-10	Dial, Tap Switch	12 Point Selector Type BN	Varies transformer output	4	203-36
	1			3-in. diameter, nickel silver, with black positioning knob	Shows tap switch setting	4	01600

19. TABLE OF REPLACEABLE PARTS (Cont'd)

Symbol No.	Fig. No.	Stock No.	Name of Part	Description	Function	Mfgr.	Mfgs. Part No.
	1, 2, 4, 5	3E4390-4	Cord Assembly, Battery	6 Ft. No. 10, 2-Conductor with Clips	D.C. Output cable	1	224-01
4	1, 2, 4, 5	3Z1940	Fuse	30 Amp. Type 4AG	To protect D.C. circuit	3	22-35
7	1, 2, 4, 5	3Z1950	Fuse	3 Amp. Type 3AG	To protect A.C. circuit	3	22-08
	1	3Z32H2-6	Spare Fuse Holder	Bakelite base, single pole, for Type 3AG, Bussmann glass fuse	Holds spare fuse	3	4450
	1, 2	6L71128-6	Lockwasher	Phosphor bronze, for $\frac{5}{8}$ -in. screw	Locks fuse posts	8	1128-6
	1, 2	6L72208-11	Lockwasher	Phosphor bronze, for #8 screw	Locks assembly bolts	8	1208
	1, 2	6L72206-8	Lockwasher	Phosphor bronze, for #6 screw	Locks assembly bolts	8	1206

20. LIST OF MANUFACTURERS

- | | | | |
|--|--|-------------------------------------|---|
| 1. Federal Telephone and Radio Corporation | 1000 Passaic Ave.,
E. Newark, N. J. | 5. Columbia Metal Box Co. | 260 E. 143 St.,
New York City. |
| 2. Cutler Hammer, Inc. | 1401 W. St. Paul Ave.,
Milwaukee, Wisc. | 6. Hoyt Electrical Instrument Works | 857 Boylston St.,
Boston, Mass. |
| 3. Bussmann Mfg. Co. | St. Louis, Mo. | 7. Newark Transformer Co. | 17 Frelinghuysen Ave.,
Newark, N. J. |
| 4. Bruno H. Ahlers | 8526—89 St.,
Woodside, L. I., N. Y. | 8. Shakeproof, Inc. | 2501 No. Keeler Ave.,
Chicago, Ill. |

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